y2522li_a1q5

January 29, 2021

1 A1

[1]:
```
# Standard imports
import numpy as np
np.seterr(all='ignore');  # allows floating-point exceptions
import matplotlib.pyplot as plt
```

1.1 Q5: Bank Fraud

1.1.1 Supplied Code (do not edit)

[2]:
```
def ReceiveTransactions():
    '''
     credit, debit = ReceiveTransactions()

     Returns two 10000x1 single-precision arrays of transactions.
       credit has all positive values
       debit has all negative values
    '''
    N = 10000

    credit = np.float32(abs(np.random.randn(N)))*20000.
    debit = -np.float32(abs(np.random.randn(N)))*20000.

    credit = np.round(credit, decimals=2)
    debit = np.round(debit, decimals=2)

    return [credit, debit]
```

[3]:
```
def CalculateNet(credit, debit):
    '''
     net = CalculateNet(credit, debit)

     Add together the credits and debits to get the net income.

     Input
       credit:  An array of positive values
```

```
        debit:   An array of negative values

     Output
        net:     The result from adding up all the credits and debits
    '''

    N = len(credit)

    scredit = np.sort(credit)
    sdebit = -np.sort(-debit)

    # Method A
    netA = np.sum(credit) + np.sum(debit)

    # Method B
    netB = np.sum(credit)
    for d in sdebit:
        netB += d

    # Method C
    netC = 0.
    for c,d in zip(scredit, sdebit):
        netC += c + d

    net = np.min([netA, netB, netC])

    return net
```

1.1.2 Process a set of transactions

[10]:
```
c, d = ReceiveTransactions()

net_income = CalculateNet(c, d)

print('Net income: '+str(net_income))
```

```
Net income: 1931991.125
```

1.1.3 (a)

Method C is the most accurate.

1.1.4 (b)

sum(credit) and sum(debit) make overflow more possible, which potentially makes the result less accurate. Method C does not calculate either or them. Instead, it gets the smallest element from scredit and the smallest element from sdebit in each loop, which makes the absolute value of 'net' small, so overflow is unlikely to happen.

1.1.5 (c)

It returns the smallest value for net income calculated through all 3 methods. It is possible that the most accurate value is not chosen and a less accurate value is returned.

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